Public Health Response

Barry S. Fields, Ph.D
Laboratory Chief

Legionellosis Webinar # 3
November 17, 2010

National Center for Immunization & Respiratory Diseases
Respiratory Diseases Branch, Division of Bacterial Diseases

Chronology of Response

- **Immediate**
  - Lab results are pending
  - Interrupt transmission
    - Close or turn off aerosol generating device (cooling tower, spa, etc.) until samples are culture negative
    - If sufficient evidence:
      - Heat flush
      - Chemical (halogen) shock
      - Point-of-use filtration
        - Must be replaced on schedule
- **These are temporary solutions (1-2 weeks) and do not address colonization**

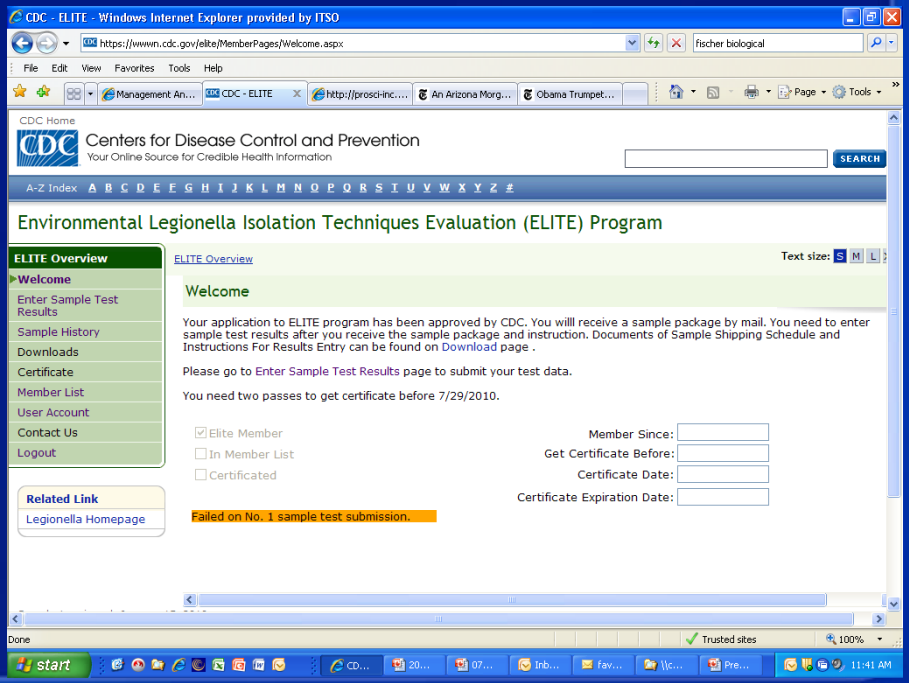
Immediate Response - Closing Facilities

- **Often not practical or warranted for:**
  - Hospitals
  - Hotels
  - Workplace

- "When can we re-open the facility?"
- Ensure heightened surveillance for additional cases

Intermediate Response - Identifying a Contractor

- **Contractor qualifications:**
  - Documented experience remediating LD outbreaks
  - Access to certified laboratory
  - Not tied to a single water treatment product
  - Days to weeks before intervention is in place



Long-term Response - Supplemental Water Treatment

- **Primary approaches:**
  - Chlorination
  - Chlorine dioxide
  - Copper/silver ionization
  - Ozonation

- Thermostatic mixing valves
- Temperature settings

Long-term Response - Follow up Testing

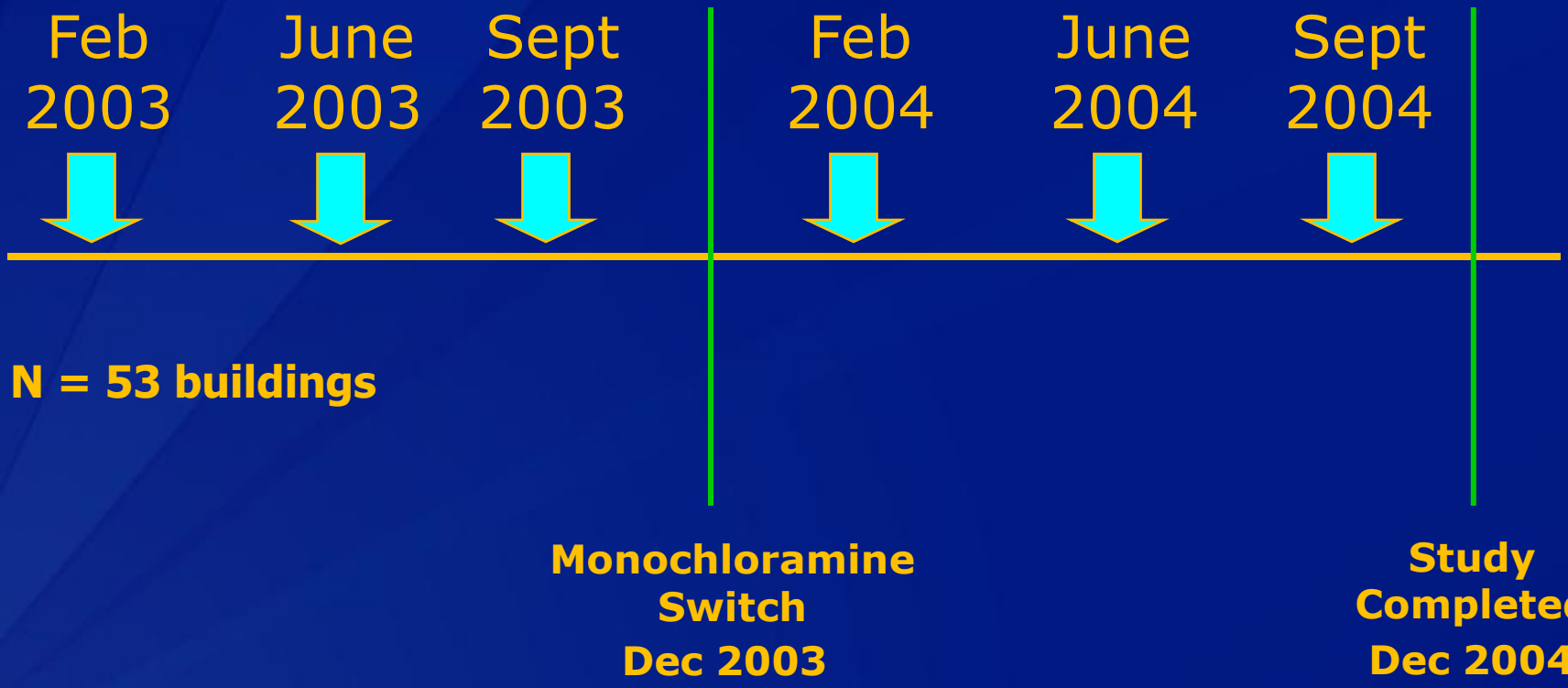
- **Once interventions is in place , culture water to detect any legionellae:**
  - Every 2 weeks for 3 months
  - Once per month for the next 3 months

- If legionellae are detected the 6 month process must be restarted

Monochloramine

- Primary disinfectant in some U.S. Municipalities
- Hospitals in cities using chlorine have > 90% greater risk of LD outbreak
- Can be applied to building as secondary disinfectant but not widely available
- May have other impacts on water quality

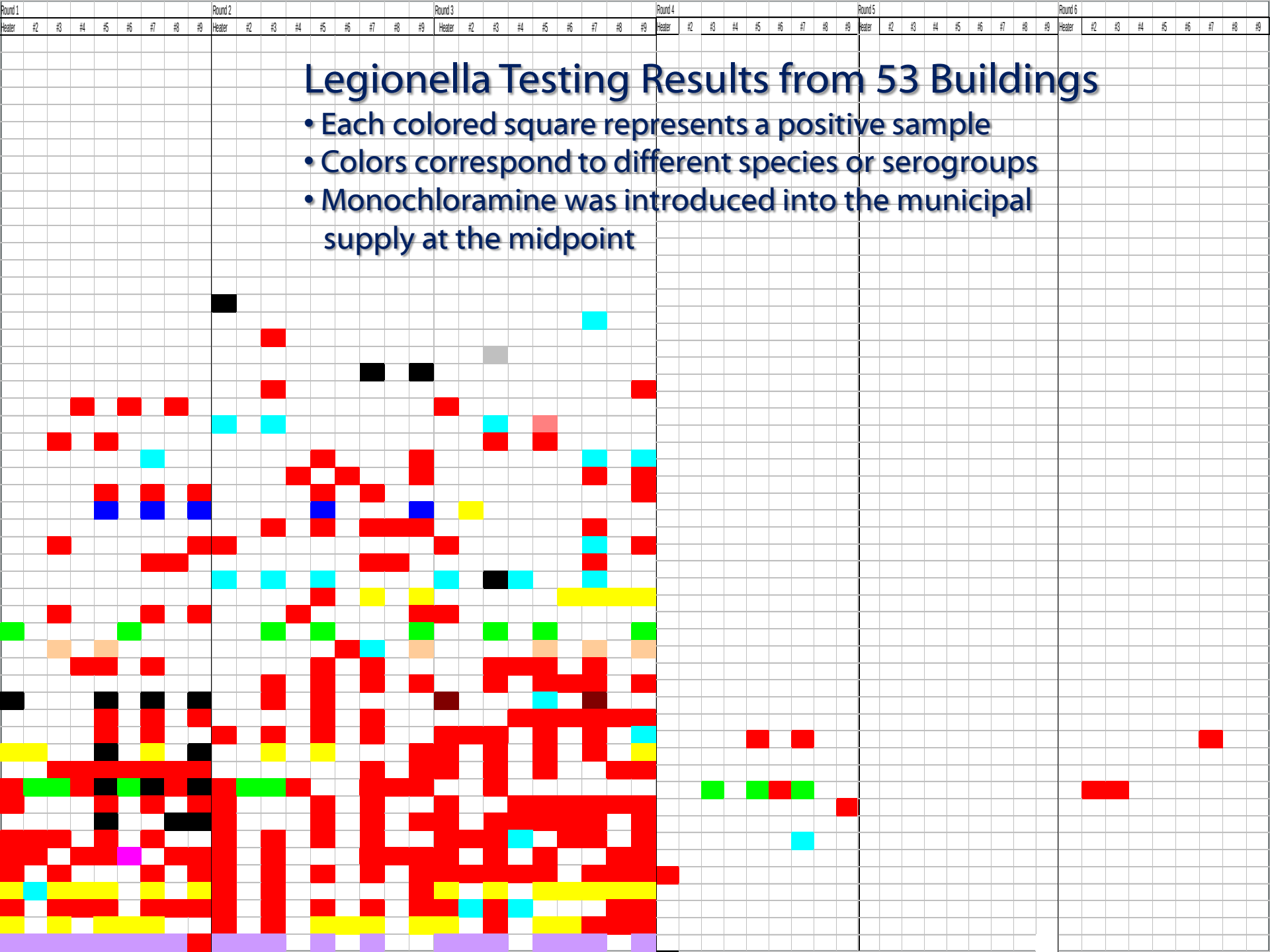
San Francisco follow-up study on the effect of monochloramine on Legionellae colonization



Flannery, et al. EID 2006;12:588-596.

Legionella Testing Results from 53 Buildings

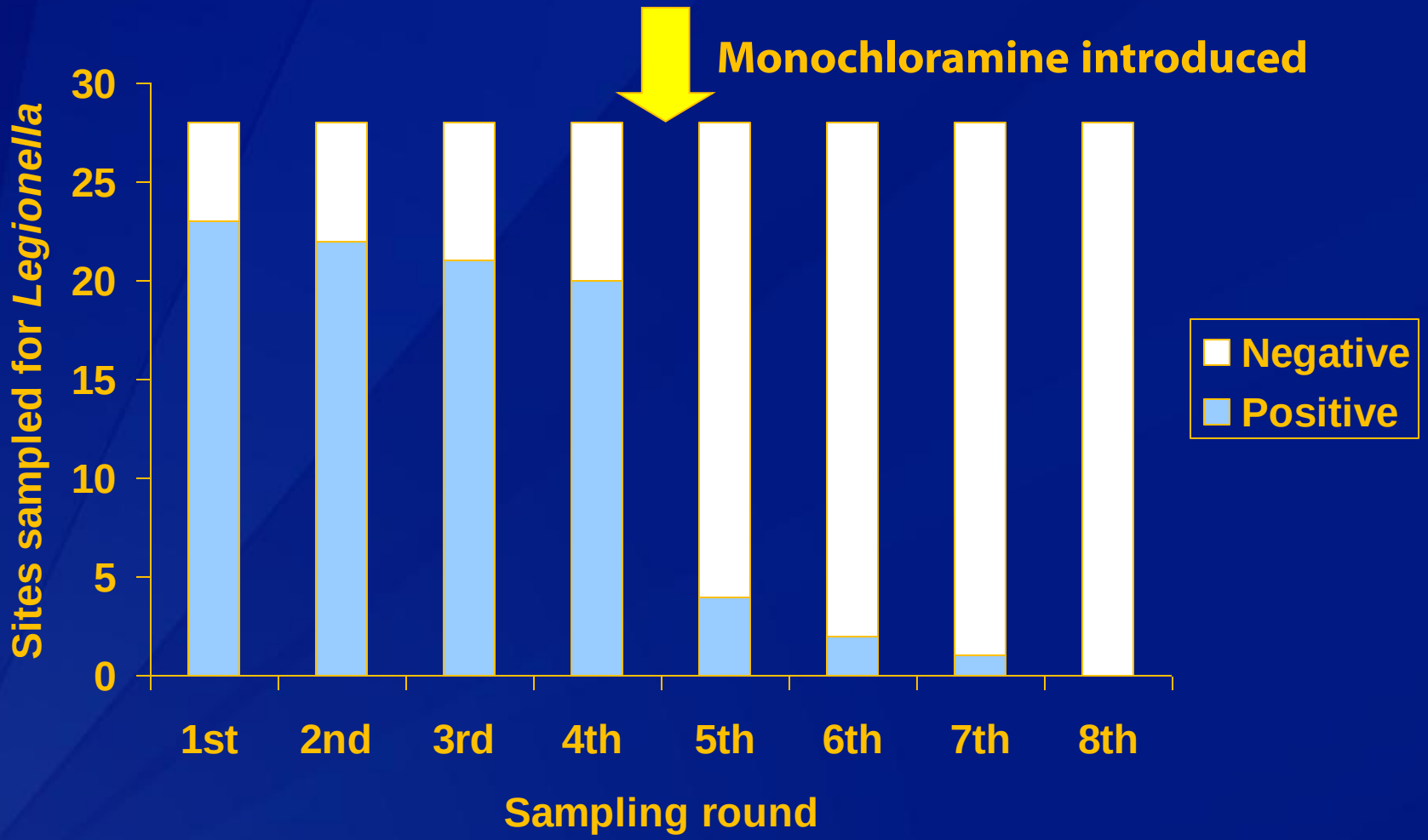
- Each colored square represents a positive sample
- Colors correspond to different species or serogroups
- Monochloramine was introduced into the municipal supply at the midpoint



Hospital Secondary Disinfection Study

- **Beginning on December 16, 2008, chlorine and ammonia were injected into the hot potable water supply to form monochloramine**
- ***Legionella, Mycobacteria*, and ameobae colonization rates were compared before and after introduction**
- **Chlorine, monochloramine, and pH levels were measured at one proximal and one distal site**

Figure 1. *Legionella* culture results pre- and post-monochloramine introduction*



*** *Legionella* isolates were predominantly *L. pneumophila* serogroup 1**

ASHRAE Guideline and Standard

- **Guideline 12 -** 2000 -Minimizing the Risk of Legionellosis Associated with Building Water Supplies

- **Standard 188** - 2011? – Prevention of Legionellosis Associated with Building Water Systems
  - Based upon Hazard Analysis and Critical Control Points (HACCP)

ASHRAE – American Society for Heating , Refrigerating, and Air-conditioning , Engineers, Inc. http://www.ashrae.org

Risk Characterization (paraphrased)

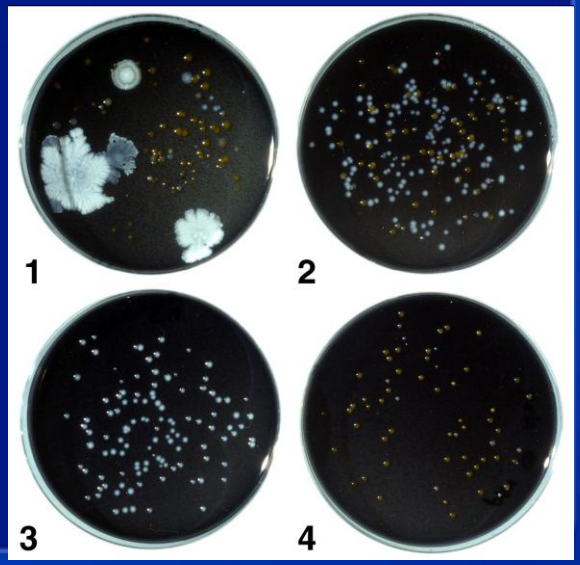
- Multiple housing units with centralized hot water heaters
- > than 10 stories-total
- Health care facility
- Occupants are immunocompromised (i.e., assisted living)
- Whirlpools and /or spas
- Aerosol generating devices (e.g., fountain, spray humidifier, etc.)

Hazard Analysis and Critical Control Point (HACCP) risk management shall be used to prevent legionellosis associated with buildings.

- Conduct a hazard analysis
- Determine the critical control points (CCP)
- Establish critical limits for each CCP
- Establish a system to monitor control of the CCPs
- Establish the corrective action to be taken when a CCP is not under control.
- Establish procedures for verification to confirm that the HACCP system is working effectively.
- Establish documentation concerning all procedures and records.

Testing Water for Legionellae

- Culture is the recommend method
- PCR or DFA procedures are supplemental – not definitive
- The benefits of testing in the absence of disease are unknown
  - Should be decided by the HACCP team based upon perceived risk



What is "safe"?

- There are no definitive data which can be used to ascribe acceptable levels of *Legionella*
- Any detectable *Legionella* can represent risk under certain circumstances
- The HACCP Team must assess the risks of individuals exposed to their building water system and review national and international published guidelines, standards, and directives when making these decisions
- ZERO TOLERANCE for strains associated with outbreaks or human disease

2006 Guideline Review

Fields, BS, and MR Moore. 2006. Control of legionellae in the environment: A guide to the US guidelines. ASHRAE Transactions 112:691-699.